Network Working Group
Request for Comments: 15

Network Subsystem for Time Sharing Hosts

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Introduction

A set of network primitives has been defined (Network Working Group Note 11) for inclusion in the monitor systems of the respective HOSTS. These primitives are at the level of system calls: SPOP's or BRS's on the 940; UUO's on the PDP-10. Presumably these UUO's are accessible to all user programs when executing for users whose status bits allow network access.

In addition to user program access, a convenient means for direct network access from the terminal is desirable. A sub-system called "Telnet" is proposed which is a shell program around the network system primitives, allowing a teletype or similar terminal at a remote host to function as a teletype at the serving host.

System Primitives

G. Deloche of U.C.L.A. has documented a proposed set of basic network primitives for inclusion in the operating systems of the respective HOSTs (NWG Note: 11). The primitives are:

Open primary connection

Open auxiliary connection

Transmit over connection

Close connection.

The details and terminology are defined by Deloche and others in previous memos. The primitives are system calls, available to programmers, and are most likely a part of the resident monitor, rather than the swappable executive.

Basic Terminal Access

In addition to user programming access, it is desirable to have a subsystem program at each HOST which makes the network immediately accessible from the teletype without special programming. Subsystems are commonly used system components such as text editors, compilers and interpreters. The first network-related subsystem should allow users at HOST A to connect to HOST B and appear as a regular terminal user to HOST B. It is expected that more sophisticated subsystems will be developed in time, but this basic one will render the early net immediately useful.

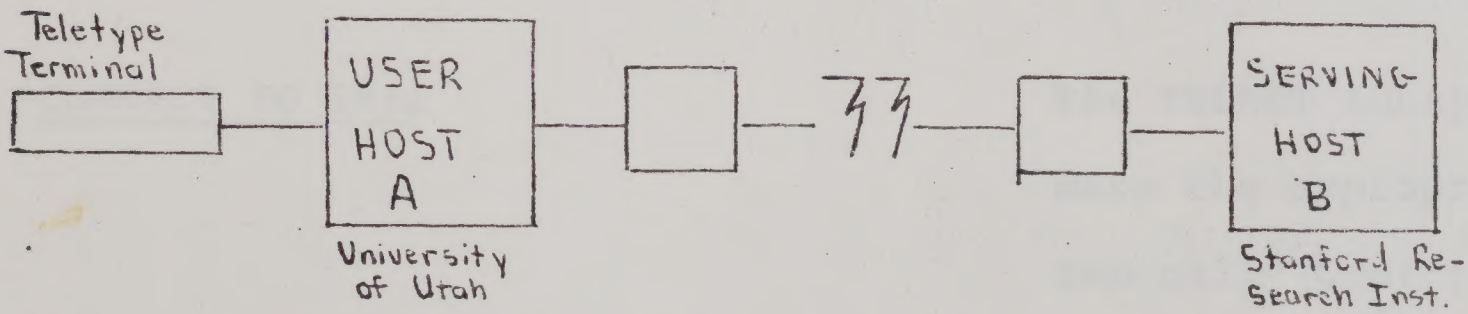

Figure 1: User accesses distant serving HOST via shunt subsystem in his own Host computer.

Simple Dialogue -- PDP-10 to 940

A user at Utah is sitting at a teletype dialed into the University's dual PDP-10's. He wishes to operate the CAL sub-system on the 940 at SRI in Menlo Park, California.

.LOGIN↓	PDP-10 login
.R TELNET↓	The PDP-10 run command is issued to call and start the TELNET subsystem.
*ESCAPE CHARACTER IS #↓	The user indicates an escape character which TELNET will watch for in subsequent input from the user.
*CONNECT TO SRI↓	The TELNET subsystem will make the appropriate system call (UUO) to establish a primary connection. The connection will be established,provided:

1. SRI is willing to accept another foreign user;
2. The UTAH user is cleared for network access at Utah. This is determined by a status word kept in the PDP-10 monitor for each user.

@LOGIN CARR.

The user logs in SRI.

Characters typed on the user's teletype are transmitted unaltered through the PDP-10 (user Host) and on to the 940 (serving HOST.) (The exception to this is a possible one-for-one code conversion required between the UCLA Sigma 7 and the PDP-10, for example).

@CAL.

The PDP-10 TELNET subsystem switches to full duplex, character-by-character transmission, since this is required by 940's. Characters typed by the user are underlined. Full duplex operation is allowed for by the PDP-10,

though not used by most DEC subsystems.

The user wishes to load a CAL file into 940 CAL from the file system on his local PDP-10.

CAL AT YOUR SERVICE

>READ FILE FROM NETWRK.

'NETWRK' is a predefined 940 name similar to PAPER TAPE OR TELETYPE. The 940 file opening BRS is set to expect an auxiliary connection and the file from UTAH.

#NETWRK: ← DSK:MYFILE.CAL)

The user types the prescribed escape character, followed by the TELNET command, to send the desired file to SRI on an auxiliary connection. The user's next statement is in CAL again.

The Telnet Subsystem

The Telnet subsystem coding should fit easily into one core page, for it does very little. It effectively

establishes a shunt in the user HOST between the remote user and the serving HOST. Telnet commands are:

ESCAPE CHAR IS _____↓

Declares a character which Telnet will watch for. Subsequent strings typed between this character and a carriage return are not shunted through to the serving host, but sent instead to the Telnet program in the user's local HOST.

This escape character is not the same as the user's host rubout character.

CONNECT TO _____↓

The official site name of the desired serving HOST is typed (i.e.: SRI, UTAH, UCLA, UCSB). Telnet attempts to establish a connection. If the attempt is successful, the following characters are shunted through the user's local machine. The connection places the

LOGOUT↓

user in the pre-logged in state at the serving HOST. Telnet issues the logout command sequence to the serving HOST. If the user simply rubs out and kills his PDP-10 job, the PDP-10 will indicate to the 940 that the connection is closed. The 940 system primitives do whatever they do when a normal dataphone connection is suddenly broken.

COPY FILE

A file copying command is available in TELNET to move data along on auxiliary connections from the user's HOST file system to the serving HOST.

On the 940 this is:

COPY <file name> TO NETWRK.

On the PDP-10:

NETWRK ← DSK: <file name>

These TELNET commands are accepted when the TELNET subsystem is first entered or following the declared escape character.

CONCLUSION

Given the basic system primitives, the TELNET subsystem at the user host and a manual for the serving host, the network can be profitably employed by a remote user. TELNET subsystem constitutes a "level 0" network program which will quickly be surpassed. It is, however, simple enough to be working fairly soon.